Women, Minorities, and Persons With Disabilities in Science and Engineering: 1996

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FOREWORD

In an increasingly global economy, making full use of all of the Nation's human resources is essential to successful international competition, world leadership in science and engineering, and an improved quality of life in the United States. Different perspectives, talents, and experiences produce better ideas and ultimately better goods and services to meet the needs of increasingly diverse markets in the United States and abroad. We need to involve all of the Nation's human resources in science and engineering to stimulate creativity, innovation, and change; contribute to the advancement of science and engineering; and foster a scientifically literate population.

We need to encourage all of the Nation's people to participate in science and engineering at each stage of the educational process and in the workforce. Some groups—women, minorities, and persons with disabilities—traditionally have not fully participated in science and engineering. Progress has been made in the achievement and participation of some of these groups but not consistently or at the same rate.

This report, the eighth in a series of biennial reports to the Congress, the administration, and others who direct public policy, presents data on participation of underrepresented groups in science and engineering. It also documents factors important to success in science and engineering in precollege education, undergraduate and graduate education, and employment. The data and analyses presented here can be used to track progress, inform development of policies to increase participation in science and engineering, and evaluate the effectiveness of such policies.

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Director

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ABBREVIATIONS

ACT	American College Testing
ADA	Americans with Disabilities Act of 1990
AP	Advanced Placement
BIA	Bureau of Indian Affairs
CIRP	Cooperative Institutional Research Program
EWC	Engineering Workforce Commission
GRE	Graduate Record Examination
HACU	Hispanic Association of Colleges and Universities
HBCU	Historically Black College or University
HEGIS	Higher Education General Information Survey
HES	Higher Education Survey
IPEDS	Integrated Postsecondary Education Data System
NAEP	National Assessment of Educational Progress
NCES	National Center for Education Statistics, U.S. Department of Education
NIH	National Institutes of Health
NPSAS	National Postsecondary Student Aid Study
NSF	National Science Foundation
R&D	research and development
S&E	science and engineering
SAT	Scholastic Aptitude Test
SDR	Survey of Doctorate Recipients
SED	Survey of Earned Doctorates
SIPP	Survey of Income and Program Participation
SME	science, mathematics, and engineering
SRS	Division of Science Resources Studies, National Science Foundation
SESTAT	Scientist and Engineer Statistics Data System

HIGHLIGHTS

Women, minorities, and persons with disabilities have historically been underrepresented in scientific and engineering occupations. Some progress has been made over the last several decades, especially in degrees to women, but there is still room for improvement. Women and minorities take fewer high-level mathematics and science courses in high school; earn fewer bachelor's, master's, and doctoral degrees in science and engineering; and are less likely to be employed in science and engineering than are white males.

Women

Course Taking in Elementary/Secondary Education

Female students are similar to males in mathematics course taking at all levels. About 80 percent of both male and female high school graduates in 1992 had taken algebra I, 69 percent of males and 72 percent of females had taken geometry, 21 percent of both had taken trigonometry, and 10 percent of both had taken calculus. Female students were also about as likely as males to have taken advanced placement calculus: 5 percent of females and 6 percent of males.

In science course taking, male and female 1992 high school graduates did not differ greatly, except in physics. Similar percentages of both male and female high school graduates had taken biology and chemistry: 92 percent of males and 94 percent of females had taken biology and 54 percent of males and 57 percent of females had taken chemistry. Male students, however, were more likely than females to have taken physics: 28 percent of males and 21 percent of females had taken physics. Male students were also more likely than females to have taken advanced placement physics. Female students have made gains over the last several years, however: in 1982, only 9 percent of women had taken physics in high school.

Science and Mathematics Achievement

Male and female students have similar mathematics proficiency on the National Assessment of Educational Progress (NAEP) mathematics assessment at ages 9, 13, and 17, although males' scores are slightly higher. In 1992, 82 percent of males and 81 percent of females scored at or above 200 at age 9, 78 percent of both sexes scored at or above 250 at age 13, and 60 percent of males and 58 percent of females scored at or above 300 at age 17.

Female students score lower than male students on the NAEP science assessment at ages 9, 13, and 17. Although the differences are small (from 1 to 3 percent lower), they are statistically significant and have been persistent since 1970. The gap between males' and females' science achievement is greatest at age 17, although female students' scores increased significantly since 1982.

Transition to Higher Education

On the mathematics component of the SAT, scores for both sexes have risen during the decade since 1984. Nevertheless, in 1994 females continued to score considerably below males, the gap narrowing only slightly over the decade. Since 1984, female scores increased 11 points to 460 in 1994, whereas male scores increased 6 points to 501. Females were also much less likely than males to place in the top range of scores (i.e., in the 600 to 800 range) on the mathematics component of the SAT. In 1994, only 14 percent of females scored in the top range versus 24 percent of males.

Differences between females and males in their intended preference for degree major are striking for students planning to enter college. Thirty-one percent of males and 13 percent of females intended to pursue natural science, mathematics, or engineering fields.[1]

Undergraduate Education

Among first-year students planning science or engineering majors in 1994, women's grades were higher than men's: 47 percent of women and 43 percent of men had average grades of A in high school.

[1] Included are the fields of agriculture/natural resources, biological sciences, computer sciences, mathematics, and the physical sciences.

Bachelor's Degrees

Women earned a smaller proportion of total science and engineering degrees (45 percent in 1993) than they did of non–science-and-engineering degrees (58 percent).

- Within the sciences, the field with the highest share of bachelor's degrees awarded to women was psychology (73 percent). Women also earned 68 percent of baccalaureates in sociology, and more than half (52 percent) of the baccalaureates in biological sciences.
- Engineering continued to be one of the least popular fields for women; in 1993, they earned 16 percent of all baccalaureates in engineering.
- In most science and engineering fields, women earned a higher proportion of bachelor's degrees in 1993 than they did in 1983. In three fields, computer science, economics, and sociology, however, women's share of bachelor's degrees decreased since 1983.

Graduate Education

In 1993, 36 percent of graduate students enrolled in science and engineering fields were women, up from 32 percent in 1988. In science fields, women constituted 44 percent of the total number of graduate students; in engineering, 15 percent. Within science fields, women were a substantial majority of graduate enrollments in psychology (70 percent) and more than half the total in biometry/epidemiology, genetics, nutrition, anthropology, linguistics, and sociology.

Master's Degrees

The proportion of women earning master's degrees in science and engineering fields reached 36 percent in 1993, having steadily increased from 31 percent a decade earlier. In engineering, one of the fields in which women are least represented, the percentage of master's degrees earned by women increased from 9 to 15 percent between 1983 and 1993.

Doctorates

Women earned 30 percent of the science and engineering doctorates awarded in 1993, up from 25 percent of the total in 1983. Their proportions varied considerably by field: 61 percent in psychology, 40 percent in biological sciences, 37 percent in social sciences, 23 percent in mathematical sciences, 16 percent in computer sciences, and 9 percent in engineering.

Employment Levels and Trends

Women are 22 percent of the science and engineering labor force. Within science and engineering, women are more highly represented in some fields than in others. Women are more than half of sociologists and psychologists but are only 9 percent of physicists and 8 percent of engineers.

Among recent bachelor's science and engineering graduates, women are less likely to be in the labor force, to be employed full time, and to be employed in their field than are men. Women constituted 44 percent of the 1992 bachelor's science and engineering graduates but are 58 percent of those out of the labor force (i.e., not employed and not seeking employment), 54 percent of those employed part time, and 47 percent of those employed full time outside their field.

Unemployment rates of men and women recent bachelor's graduates do not differ greatly: 4.1 percent of female and 4.7 percent of male 1992 bachelor's science and engineering graduates were unemployed in April 1993. Among doctoral scientists and engineers, women are more likely than men to be unemployed, although the difference is small. The unemployment rate for doctoral women in 1993 was 1.8 percent; for men, it was 1.6 percent.

Women scientists and engineers are more likely than men to be employed in academia, but among academics, women are less likely than men to be in science and engineering. Women are 44 percent of faculty in non–science-and-engineering fields but only 24 percent of science and engineering faculty. Women faculty differ from men in terms of teaching field, type of school, full- or part-time employment, contract length, primary work activity, productivity, rank, and tenure.

- Within science and engineering, women are 43 percent of psychology faculty and 31 percent of mathematics faculty but only 14 percent of physical science and 6 percent of engineering faculty.
- Women science and engineering faculty are far less likely than men faculty members to be employed in research universities and are more likely to be employed in 2-year schools.
- Women science and engineering faculty are much more likely than men to teach part time (40 percent versus 25 percent), and women are more likely than men to have fixed-term contracts. Fifty-four percent of women science and engineering faculty are on a one-term or 1-year contract, compared with 34 percent of men.
- Fewer women than men science and engineering faculty have a PhD degree. A far higher proportion of women (42 percent) than men (24 percent) faculty have a master's degree as their highest degree.

- Women are less likely than men to be engaged in funded research, to be a principal investigator or co-principal investigator, or to have published books or articles in the previous 2 years. These differences remain even with research universities and among all age groups.
- Among full-time science and engineering faculty, women are less likely to chair departments. Only 11 percent of women, but 14 percent of full-time men science and engineering faculty, chair their departments.
- Women scientists and engineers hold fewer high-ranked positions in colleges and universities than men. Women are less likely than men to be full professors and are more likely than men to be assistant professors or instructors. Part of this difference in rank can be explained by age differences, but differences in rank remain even after controlling for age. Among those who received their doctorates 13 or more years ago, 72 percent of men but only 55 percent of women are full professors.
- Women are also less likely than men to be tenured or to be on a tenure track. Forty-three percent of full-time employed women science and engineering faculty are tenured, compared with 67 percent of men.

Among doctoral scientists and engineers employed in industry, women and men having a similar number of years of professional experience are equally likely to be in management. For example, among those who received degrees between 1970 and 1979, 32 percent of both women and men are managers.

Within science and engineering, women tend to be more highly represented in fields with lower average salaries. The 1993 median starting salary for recent women bachelor's science and engineering graduates was lower than that for men overall, but within fields, the median starting salaries were more nearly the same. Among more experienced bachelor's scientists and engineers, the gap between men's and women's salaries is larger.

A substantial salary gap exists between men and women with science and engineering doctorates. Almost 90 percent of the observed $13,200 gap, however, can be explained by differences between men and women on the following variable groups: years from doctorate degree, science and engineering degree field, other background variables, work-related employee characteristics, employer characteristics, type of work performed, and indicators of "life choices."

Minorities [2]

Elementary/Secondary Education

Course Taking

Both science and mathematics course taking by minorities have increased over the last decade. The percentages of black, Hispanic, and American Indian students taking many basic and advanced mathematics courses have doubled between 1982 and 1992. For example, 30 percent of black high school graduates in 1982 had taken geometry and 1 percent had taken calculus. By 1992, this had increased to 60 percent and 7 percent, respectively.

Substantial differences in course taking by racial/ethnic groups remain, however. Black and Hispanic high school graduates in 1992 were far less likely than white and Asian students to have taken advanced mathematics courses and far more likely to have taken remedial mathematics courses. Thirty-one percent of black, 24 percent of Hispanic, and 35 percent of American Indian graduates, compared with about 15 percent of white and Asian graduates, had taken remedial mathematics in high school. Although about 60 percent of both white and Asian students had taken algebra II, less than half of blacks, Hispanics, and American Indians had taken this course. Asians were most likely of any racial/ethnic group to have taken advanced mathematics courses. Almost one-third of Asians had taken trigonometry, and one-fifth had taken calculus. By contrast, 22 percent of whites, 13 percent of blacks, 15 percent of Hispanics, and 10 percent of American Indians had taken trigonometry and far fewer took precalculus or calculus.

Blacks, Hispanics, and American Indians are taking more science classes than they took in the past. The percentage of blacks and Hispanics taking chemistry and physics doubled between 1982 and 1992. In 1982, 22 percent of black and 17 percent of Hispanic high school graduates had taken chemistry. By 1992, this had increased to 46 percent and 43 percent, respectively. In 1982, 7 percent of blacks and 6 percent of Hispanics had taken physics; by 1992, 18 percent of blacks and 16 percent of Hispanics had taken physics.

Despite gains, racial/ethnic differences persist in high school science course taking. Black and Hispanic students are far less likely than white students to have taken advanced science courses. Although black and Hispanic high school graduates are about equally likely

[2] Topics covered in this report are presented for five racial/ethnic groups: white, black, Hispanic, Asian, and American Indian. The term "minority" includes all groups other than white; "*underrepresented* minorities" includes three groups whose representation in science and engineering is less than their representation in the population: blacks, Hispanics, and American Indians.

as white and Asian students to have taken biology, they are much less likely than whites and Asians to have taken chemistry or physics. Only 46 percent of black, 43 percent of Hispanic, and 33 percent of American Indian high school graduates had taken chemistry compared to 58 percent of white and 67 percent of Asian high school graduates. Although 42 percent of Asian and 26 percent of white students had taken physics, less than 20 percent of black, Hispanic, and American Indian students had taken physics in high school.

Achievement

NAEP mathematics assessment scores improved for white, black, and Hispanic students at ages 9, 13, and 17 between 1982 and 1992. Gains for black and Hispanic students were higher than those for white students. In 1992 for example, 13 percent more black 17-year-olds and 18 percent more Hispanic 17-year-olds, compared with 12 percent more white 17-year-olds, scored at or above 300 than had scored that high in 1982.

Despite these gains, mathematics scores for black and Hispanic students remain substantially lower than those of white students at all three age levels. The median scores for black and Hispanic students at all three age levels are lower than the 25th percentile scores for white students.

NAEP science assessment scores increased for students at ages 9, 13, and 17 between 1982 and 1992, although scores for some racial/ethnic groups increased more than others. The gap between black and white and between Hispanic and white science scores narrowed for 9-year-olds between 1982 and 1992. Fifty-one percent of black 9-year-olds scored at or above 200 in 1992, compared with 39 percent in 1982, a 12-percentage-point increase. The percent of Hispanic 9-year-olds scoring at or above 200 increased from 40 percent in 1982 to 56 percent in 1992, a 15-percentage-point increase. The comparable gain for white 9-year-olds was from 78 percent in 1982 to 86 percent in 1992, a 7-percentage-point increase. No narrowing of the gap was evident for black or Hispanic 13-year-olds or 17-year-olds. Despite these gains, scores for whites are substantially higher than those for blacks and Hispanics at all age levels, and differences are greatest at age 17.

Schools, particularly secondary schools, in urban areas with a high proportion of economically disadvantaged or a high proportion of minority students offered less access to science and mathematics education. Many factors contribute to unequal participation of minorities in science and mathematics education, including tracking, judgments about ability, number and quality of science and mathematics courses offered, access to qualified teachers, access to resources, and curricula emphases.

Being labeled by ability is very important to student achievement because teachers tend to have different expectations of students in the various groups. Teachers in "high-ability" classes are more likely than "low-ability" classes to emphasize the development of reasoning and inquiry skills. Students in "low ability" classes are more likely to read from a textbook and less likely to participate in hands-on science activities, are more likely to spend time doing worksheet problems, and are less likely to be asked to write reasoning about solving a mathematics problem.

Minority students also have less access to qualified teachers. Mathematics classes with a high proportion of minorities are less likely than those with a low proportion of minorities to have mathematics teachers with majors in the field.

The instructional emphases in largely minority classes are likely to differ as well. The teachers in science and mathematics classes having a high minority enrollment are more likely to emphasize preparing students for standardized tests and are less likely than those in classes having fewer minority students to emphasize preparing students for further study in science or mathematics.

Transition to Higher Education

On the mathematics component of the SAT, the scores of every racial/ethnic group improved over the decade. In 1994, Asians continued to have the highest average mathematics SAT scores, followed in order by whites and American Indians, Latin Americans, Mexican Americans, Puerto Ricans, and blacks. Asian students also achieved the highest increase in mathematics scores of any racial/ethnic group, with scores rising 16 points over the decade. Black students achieved the second highest increase in scores (15 points), and American Indian students achieved a 14-point increase.

The amount and type of coursework taken in high school are related to the scores achieved on the SAT. In particular, Asians and whites, the two groups with the consistently highest mathematics scores on the SAT, were also the two groups who had taken the most courses in mathematics and natural science in high school.

The SAT data show that for every racial/ethnic group, higher reported levels of parental income are generally associated with higher scores on both the verbal and mathematics sections of the SAT. Family income does not uniformly relate to level of achievement, however. The mean SAT mathematics score of 482 for those Asian students at the lowest family income level (under $10,000) exceeded the scores at the highest family levels for several of the underrepresented minorities groups.

Within every racial/ethnic group, higher levels of parental education were associated with higher student scores on the mathematics portion of the SAT. For example, the difference in mean SAT mathematics scores between the group whose parents did not receive a high school diploma and those whose parents held a graduate degree ranged from 120 points for whites to 85 points for blacks.

Racial/ethnic differences in choice of undergraduate major are less dramatic than the differences by sex. Particularly when the social sciences are separated from the natural sciences and engineering, the differences in sex preference become striking: the proportion of males intending to major in natural sciences and engineering was significantly higher in all racial/ethnic groups than the proportion of females intending to major in these subjects. For instance, the proportion of males intending to major in natural science/engineering ranged from 28 percent for American Indian and Puerto Rican males to 37 percent for Asian males. For females, however, the proportion intending to study natural science/engineering was much lower, ranging from 12 percent for Mexican Americans to 16 percent for Asians.

Undergraduate Education

Two-Year Institutions

Two-year institutions have been particularly important in providing access to higher education for traditionally underrepresented groups of students. Two-year colleges enroll 46 percent of the students entering higher education as first-year students; they enroll 50 percent of students from underrepresented minority groups entering college. Although the number of students enrolled full time at 2-year institutions rose by 20 percent from 1980 to 1993, the number of students from underrepresented minority groups enrolled as full-time students increased 39 percent.

Four-Year Institutions

Enrollment of minorities in 4-year institutions has increased at the same time that enrollment of white students leveled off or decreased. Full-time enrollment of underrepresented minorities increased 37 percent between 1980 and 1993 whereas white enrollment increased 1 percent. Among first-year students at 4-year institutions, enrollment of underrepresented minorities increased 18 percent between 1980 and 1993; enrollment of whites decreased 16 percent in that time.

Attrition From Higher Education

Attrition from higher education is greater for minority students. Although underrepresented minorities are 21 percent of first-time first-year undergraduate enrollment, they are only 12 percent of bachelor's degree recipients.[3] Comparison of enrollment profiles for cohorts enrolled in the lower division in 1991 and the upper division[4] in 1993 shows differential declines in the size of cohorts enrolled from different racial/ethnic groups. Comparing across this 2-year period, the losses in numbers of full-time students enrolled were approximately 36 percent of blacks, 22 percent of Hispanics, and 12 percent of American Indians, compared with 8 percent of whites.

Bachelor's Degrees

Underrepresented minorities—blacks, Hispanics, and American Indians—are as likely to earn bachelor's degrees in science and engineering as they are to earn bachelor's degrees in other fields. Blacks earned 7 percent of both science and engineering and non–science-and-engineering degrees, Hispanics earned 5 percent, and American Indians earned 0.5 percent. Asians were more likely to earn degrees in science and engineering than in other fields. They earned 7 percent of bachelor's degrees in science and engineering in 1993 and 3 percent of non–science-and-engineering degrees.

Historically Black Colleges and Universities (HBCUs) continue to play an important role in the undergraduate education of blacks, despite the growing diversity of the Nation's campuses. Thirty percent of the black students receiving bachelor's degrees in science and engineering in 1993 received their degrees from an HBCU.

Graduate Education

Blacks, Hispanics, and American Indians continued to be seriously underrepresented in graduate science and engineering programs. Blacks were 5 percent, Hispanics 4 percent, and American Indians 0.4 percent of the total U.S. citizen enrollment in graduate science and engineering programs. Asians were 7 percent of U.S. citizen enrollment.

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[3] U.S. citizens and permanent residents only.

[4] Placement in a division depends on numbers of credits earned toward the baccalaureate; lower division students generally have fewer than half the number needed to graduate; upper division students, one-half or more.

Master's Degrees

Minorities earned 17 percent of master's degrees in science and engineering in 1993, compared with 13 percent in 1985. Asians increased from 6 percent of master's degrees in 1985 to 8 percent in 1993; blacks and Hispanics both increased from 3 percent in 1985 to 4 percent in 1993.

Doctorates

Minorities who were U.S. citizens earned 11 percent of the total science and engineering doctorates awarded to U.S. citizens in 1993, up from 7 percent of the total in 1983. For all of the underrepresented minorities, the numbers of science and engineering doctorate recipients in 1993 were very small: 374 blacks, 446 Hispanics, and 43 American Indians.

Employment Levels and Trends

With the exception of Asians, minorities are a small proportion of scientists and engineers in the United States. Asians were 9 percent of scientists and engineers in the United States in 1993, although they are only 3 percent of the U.S. population. Blacks, Hispanics, and American Indians as a group are 23 percent of the U.S. population, but only 6 percent of the total science and engineering labor force.[5] Blacks were 3.5 percent, Hispanics were almost 3 percent, and American Indians were 0.02 percent of scientists and engineers.

Underrepresented minorities are an even smaller proportion of doctoral scientists and engineers in the United States than they are of bachelor's or master's scientists and engineers. Asians were 11 percent of doctoral scientists and engineers in the United States in 1993. Blacks were 2 percent, Hispanics were 2 percent, and American Indians were less than half of 1 percent of doctoral scientists and engineers.

In 1993, unemployment rates of doctoral scientists and engineers by race/ethnicity did not differ significantly. The differences in unemployment were small and were consistent with what is expected from chance variations due to sampling.

Within the doctoral science and engineering labor force as a whole, minority scientists and engineers differ in their field of employment.

- Half of black doctoral scientists and engineers, but only 29 percent of all scientists and engineers, are in the social sciences and psychology. Only 11 percent of black doctoral scientists and engineers compared with 21 percent of all doctoral scientists and engineers are in physical sciences, and only 11 percent of black doctoral scientists and engineers, compared with 16 percent of the total, are in engineering.
- Hispanic doctoral scientists and engineers are similar to whites in terms of field.
- Thirty-seven percent of Asians are in engineering, compared with 16 percent of all doctoral scientists and engineers, and only 10 percent of Asians are social scientists, including psychologists, compared with 29 percent of all doctoral scientists and engineers. U.S.-born[6] Asians are similar to whites in terms of field. Non-U.S.-born Asians, on the other hand, as well as non-U.S.-born scientists and engineers in general, are disproportionately likely to be engineers.

Racial/ethnic groups differ in their academic employment characteristics. The types of institutions in which they teach differ; they differ in employment status, in highest degree, in research activities, in rank, and in tenure.

- Asian faculty are far less likely than other groups to be employed in 2-year colleges or to have a master's as their highest degree. They are more likely than others to be engaged in funded research, to be principal or co-principal investigators, and to have publications within the last 2 years—at all ages and within research universities.
- Black faculty are less likely than other groups to be employed in research institutions and are more likely to be employed in comprehensive institutions, liberal arts schools, and 2-year colleges. Black faculty have fewer publications in the previous 2 years than white scientists and engineers—at all ages and in all types of schools. Black faculty are also less likely than other groups to be engaged in funded research or to be a principal investigator or co-principal investigator.
- Hispanic faculty are less likely than other groups to be employed in research institutions and are more likely to be employed in 2-year colleges.
- Among full-time ranked science and engineering faculty, Asians, blacks, and Hispanics are less likely than whites to be full professors. Forty-one percent of Asians, 33 percent of blacks, and 45 percent of Hispanics, compared with 49 percent of whites, are full professors. When age differences are accounted for, Asian and Hispanic faculty are

[5] The science and engineering field in which blacks, Hispanics, and American Indians earn their degrees has a lot to do with participation in the science and engineering labor force. Blacks, Hispanics, and American Indians are disproportionately likely to earn degrees in the social sciences and to be employed in social science practice, e.g., social worker, clinical psychologist, rather than in social sciences per se.

[6] The term "U.S.-born" refers to those born in the United States. The term "non-U.S.-born" refers to those born outside of the United States.

as likely or more likely than white faculty to be full professors, but black faculty are still less likely than other faculty to be full professors. Among ranked faculty who received doctorates 13 or more years previously, only 58 percent of black faculty compared to 70 percent of white faculty were full professors.

- Black, Hispanic, and Asian faculty are also less likely than white faculty to be tenured. Fifty-four percent of black faculty, 52 percent of Hispanic faculty, and 57 percent of Asian faculty compared with 64 percent of white faculty are tenured.

Black, Hispanic, and Asian scientists and engineers differ little from white scientists and engineers in their primary work activity. The one exception is that among doctoral scientists and engineers, Asians are much more likely than other groups to be engaged in research and development.

The median starting salaries of new bachelor's and master's science and engineering graduates by race/ethnicity are not dramatically different. Racial/ethnic status does not appear to have much effect on salary within the very "elite" population of full-time employed individuals with doctoral science and engineering degrees when one compares groups with similar characteristics on relevant variables expected to affect salary.

Persons With Disabilities

Elementary/Secondary Education

The incidence of elementary/secondary students with disabilities is increasing. Approximately 6 percent of the population of children from birth through age 21 in the United States were in federally supported special education programs in 1992–1993, compared with 4.5 percent in 1976–1977.

More than half of the children ages 6 through 21 with disabilities had specific learning disabilities, and another one-fifth had speech or language impairments. Students with these disabilities were most likely to be either in a regular class environment or in a resource room. Students with other, less prevalent disabilities, such as mental retardation and autism, were more likely to be taught in separate classes or separate schools. Those with speech or language impairments, as well as those with visual impairments, were most likely to spend more than half of their class time in regular education academic classes.

Science and Mathematics Education

Students with physical disabilities make up 4 to 6 percent of the science students and 2 to 6 percent of the mathematics students in grades 1 through 12. Students with mental disabilities make up 2 to 9 percent of the science students and 1 to 5 percent of the mathematics students in grades 1 through 12. Students with mental disabilities are more likely to be included in regular science instruction than in mathematics instruction.

The fraction of students with learning disabilities is much smaller in high school than in the earlier grades. Slightly more than half of the science and mathematics classes in grades 1–4, but only 31 percent of the science classes and 24 percent of the mathematics classes in grades 9–12, have students with learning disabilities. The fraction of students with physical and mental disabilities is much smaller and varies less by grade. Four percent of science classes and 6 percent of mathematics classes in grades 1–4 have at least one student with a physical disability, compared with 5 percent of science classes and 2 percent of mathematics classes in grades 9–12.

Transition to Higher Education

Four percent of high school seniors in 1994 reported a disabling condition; they tended to have lower mean scores on the SAT than did seniors who reported having no disabilities. In mathematics, the average SAT score for students with disabilities was 436, compared with 483 for other students.

Undergraduate Education

Choice of Field

Students with disabilities are as likely to choose science and engineering majors as they are to choose other majors. Students with disabilities constituted 9 percent of first-year students with planned majors in science and engineering and also 9 percent of those planning majors in non–science-and-engineering fields. Students with disabilities constituted a higher proportion of planned majors in physical sciences (10 percent) and social sciences (10 percent) than they did in engineering (8 percent).

Doctorates

The number of science and engineering doctorates earned by people who reported that they had disabilities was 329 in 1993, barely 1 percent of the total science and engineering doctoral degrees awarded.

Earning a doctorate generally takes longer for students with disabilities than for those without. Almost half (47 percent) of 1993 doctorate recipients with disabilities spent more than 10 years completing their doctorates; only a third (34 percent) of all 1993 doctorate recipients took this long.

Employment Levels and Trends

About 20 percent of the population have some form of disability; about 10 percent have a severe disability.[7] Persons with disabilities were 13 percent of all employed persons in 1991 and were 5 percent of the 1993 science and engineering labor force.

The proportion of scientists and engineers with disabilities increases with age. More than half became disabled at age 35 or later. Only 7 percent had been disabled since birth, and only 25 percent had been disabled before the age of 20.

Unlike women and minorities, persons with disabilities are not particularly concentrated in certain fields.

Recent bachelor's science and engineering graduates with disabilities are somewhat less likely than those without disabilities to enroll either full time or part time in graduate school. Twenty-six percent of 1992 bachelor's science and engineering graduates with disabilities were full-time or part-time graduate students in 1993, compared with 31 percent of comparable graduates without disabilities.

The unemployment rates of recent bachelor's science and engineering graduates with and without disabilities are similar. The unemployment rate for 1992 bachelor's science and engineering graduates with disabilities was 4.7 percent compared with 4.5 percent for those without disabilities.

The labor force participation rates of doctoral scientists and engineers with and without disabilities are quite different. Almost one-quarter of doctoral scientists and engineers with disabilities are out of the labor force, compared with only 7 percent of those without disabilities.

Among those in the labor force, persons with disabilities are more likely than those without disabilities to be unemployed and to be employed part time. The unemployment rate for doctoral scientists and engineers with disabilities was 2.4 percent compared with 1.6 percent for those without disabilities. The percentage of doctoral scientists and engineers in the labor force who were employed part time in 1993 was 11 percent for those with disabilities and 6 percent for those without disabilities.

Doctoral scientists and engineers who are employed in universities and 4-year colleges and who have disabilities are more likely than those without disabilities to be full professors and to be tenured. Because incidence of disability increases with age, scientists and engineers with disabilities tend to be older and to have more years of professional work experience than those without disabilities. Among pre-1985 graduates, the differences in rank and tenure status between persons with disabilities and persons without disabilities are narrower.

The type of work that bachelor's-level and master's-level scientists and engineers with disabilities do is not greatly different from the type of work done by those without disabilities. The primary work activity of 27 percent of bachelor's scientists and engineers with disabilities is computer applications, compared with 29 percent of those without disabilities. Design of equipment is the primary work activity of 15 percent of bachelor's scientists and engineers both with and without disabilities. Ten percent of bachelor's scientists and engineers with disabilities and 11 percent of those without disabilities are in management and administration.

Within industry, doctoral scientists and engineers with disabilities are more likely than those without disabilities to be in management. Again, this is a function of age. Among doctoral scientists and engineers age 45 and older and employed in business or industry, 32 percent of both those with disabilities and those without disabilities are in management.

Disability status appears to have a slight effect on salary among those full-time employed individuals with doctoral science and engineering degrees when one compares groups with similar characteristics on relevant variables expected to affect salary. Those with disabilities average salaries approximately $1,000 a year less than those without disabilities.

[7] Estimates of the proportion of the population with disabilities vary due to differing definitions of "disability." See the appendix A Technical Notes for a discussion of the limitations of estimates of the size of this group. The source of these estimates is the U.S. Department of Commerce, Bureau of the Census. 1993. *Americans With Disabilities: 1991–92*: Data from the Survey of Income and Program Participation, P70-33.